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## FUELS AND RELATED EQUIPMENT

### NIKITIN DISCUSSES TYUMEN' RESOURCES

Moscow NEDELYA in Russian No 28, 10-16 Jul 78 pp 4-6

[Article by V. Nikitin, Chairman of Ispolkom, Tyumenskaya Oblast Soviet:  
"What Are Tyumen's Riches?"]

[Text] I posed this question in the headline on purpose, even though I am sure that 99 out of 100 people would answer, "Tyumen' is the oil and gas area." And of course this is true.

Not long ago the country heard about the billionth ton of oil extracted since the beginning of development of this oblast's oilfields. Such a high rate of development of the underground stores of black gold is unheard of throughout the world. The main growth in liquid fuel during this five-year plan is from our oblast. Every other ton of oil is from Tyumen'. Tyumen' is a rich storehouse of gas and gas condensate. All this is true. Nonetheless, the idea of the "land of Tyumen'" does not stand only for oil and gas. To conceive of what is behind this expression, you would at the very least have to get on an airplane and fly over the expanses of the oblast, from the endless steppes of Kazakhstan to the frigid Kara Sea. Then there would open to your view the wide-ranging forest steppe to the south, which further to the north gives way to a belt of immense taiga forests, followed by forest tundra, and finally the Arctic tundra of the Far North. You would see thousands of large and small streams and hundreds of thousands of lakes. In spring the southern regions of the oblast would delight you with the green covering of the fields, but on the same day, somewhere in the polar area, you might be caught in a vicious blizzard.

This is the nature of this harsh but bountiful land.

However, it has not always given all of its riches so unstintingly as it does now. In the pre-Revolutionary archives we can read a good many tragic descriptions of the extreme backwardness of industry and agriculture in the former Tobol'skaya Guberniya. In semiprimitive workshops, people dressed hides, sewed sheepskins, made felt boots, and produced candles, soap, rope, bricks and carpets. We can judge the capacity of these "giants of local industry" by the fact that each employed an average of three persons.

The extremely rich forest resources were left practically unused: they were mainly cut down along the riverbanks to serve as fuel for the steamboats, burned into charcoal, or used as a source of resin and tar. The valuable fish--sturgeon, sterlet, whitefish, white salmon and shchekur--were fished rapaciously during the migrations to the breeding areas and during spawning. The fur industry, a long-standing occupation of the Siberians, was pushed to exhaustion. All output was sold by traders and professional hunters, and fish and furs were bartered for cheap trinkets. The peasant economy with its primitive tools exhausted itself in an unequal struggle with the encroaching taiga, while harsh droughts completed the gloomy agricultural picture.

Education, health care and culture were in an extremely rudimentary condition, even in the towns. The area that gave Russia the great D. I. Mendeleyev, the composer A. A. Alyab'yev and the author of "Kon'yak-Gorbunok," the poet P. P. Yershov, remained at the same time an area of complete or almost complete illiteracy and served as an area of exile.

Nature hid the treasures of the Tyumen' area from mankind for a long time. While they rapaciously destroyed what lay on the surface, ready to hand, in plain sight, the Tsarist rulers did not even consider searching the immense expanses of Western Siberia, with its lack of roads, its taiga, swamps and harsh climate. This came about through the efforts of the perpetual owner of the country, the people. We will never forget that even during the first years of Soviet rule, in accordance with V. I. Lenin's directives and under his leadership, the systematic scientific study of the Far North was begun.

Years passed. Lenin's behests on the necessity for the profound study and thorough development of the natural riches of Siberia became embodied in the decisions of CPSU congresses, in decrees of plenary sessions of the party Central Committee and in five-year plan directives. Fulfilling the wishes of the party and the people, thousands of persons of different trades and nationalities, not only Siberians, but inhabitants of other regions as well, came to work in Siberia and took the taiga by storm. In spite of difficulties, they searched for oil, natural gas and other minerals.

And they found them. The subterranean regions of Siberia opened their stores of iron and manganese ores, coal, mica, rock crystal and peat. Every year the land of Tyumen' uncovers more of its treasures, gains strength, breathes heroically, deeply, freely. Today its contribution to the country's oil and gas industry numbers over a thousand fields, including those of Samotlor and Uren-goy. By supplying half of Soviet oil and a large quantity of gas, the oblast feeds a life-giving stream to the country's economy.

The people of Tyumen' heard Leonid Il'ich's words, quoted at the top of the page, as a high evaluation of their labor, and as a mandate for the future. For us in Tyumen', the observations and suggestions which he made during his visit to Siberia and the Far East are a militant program of action for both the near future and the long run. There is no doubt that we will do everything so that this area, which in the past was ruled by savagery and poverty, where

minority peoples were cruelly exploited, where political exiles suffered in the dense forests, will more rapidly and fully place its riches at the service of the Motherland.

To limit ourselves to what was said above about Tyumen' would be to keep back at least half of what it has achieved, what it is living for today, what it strives for. In my work I frequently visit enterprises, construction sites, kolkhozes and sovkhoses, and talk to the people. And although you frequently know in advance what is supposed to happen, when and where, every time you see it in actuality, you cannot help but be astonished by the pace and the scale of the transformation. When the first stack of the future electric power station was installed in Surgut in June 1972, few would have believed that about a year and a half later this GRES would already be producing energy--the cheapest electrical energy in the country--using casing-head gas. (Previously it had simply been burned up in flares, for there was no place to put it!) If the first oil pipeline in Siberia, 400 kilometers long, took two years to lay, now main pipelines 1,500 kilometers long are completely constructed during a single winter.

These examples--and dozens of them could be given--attest to one particularly important characteristic of life in Tyumen', which could be called the "Tyumen' acceleration." For this impetuous, dynamic growth is typical not only of the oil and gas extraction industries, but typifies the other sectors of the oblast economy to the same degree. Since 1965, when the West Siberian Fuel and Power Region was established, the output of industrial products in the oblast has increased 6.4 times. A large number of new plants and dwelling construction combines have been built, and new sectors, such as the oil extraction, gas refining, textile and motor vehicle industries, have appeared.

Today the oblast is producing engines, high-capacity tractor attachments, medical instruments, construction machinery, wood processing tools, river boats, including the unique "Severnoye Siyaniye" floating electric power station, automotive electrical equipment, batteries, furniture, textiles, forging equipment, plastic items and dozens of other industrial products. Many products from Tyumen' have received the state seal of quality.

The people of Tyumen' are mastering the natural riches of their area not as temporary visitors, but thriftily. In the taiga regions of the oblast, the semifinishing of lumber has developed on a large scale, and commodity reserves are more than 5 billion cubic meters. But although the supplies of timber are huge, the lumbermen and foresters are striving to stick to the rule of planting young trees where mature ones have been cut down. More and more powerful, modern equipment, which will completely eliminate heavy physical labor, is now becoming available to them. The workers of the forest industry are working steadily to develop a wood processing base so as to deliver finished products rather than semifinished to the construction sites and enterprises, using saw-mill byproducts for the purpose.



Tyumen' consists not only of rich forests, however, but of rich water areas as well. Their potential productivity, even without expenditures on improvement, amounts to millions of quintals of fish per year. Let me repeat: potential productivity. The actual productivity is considerably less: last year we caught 340,000 quintals. This is because of the intensity of the fishing during the Great Patriotic War and in the postwar period and the gradual pollution of the waters, which killed off the valuable spawn of sturgeon and sig [type of salmon]. As a result, by the end of the 60's the catch had been halved, falling to 150-160 thousand quintals. But during the Ninth Five-Year Plan we succeeded in basically regaining the previous level. During the Tenth Five-Year Plan the fishing industry's output is to grow by 1.6-1.7 times, reaching 500-550 thousand quintals.

This task is being accomplished in such a way as to increase the fishing industry's reserves at a stepped-up pace. Several fish farms have been started in the oblast, and new bases and complexes for the collection and incubation of spawn and the raising of commercial fish from the fingerling stage are being built. In this year alone, 700 million sig fingerlings have been released into lakes. This makes possible a fuller utilization of the food resources of the lakes and will significantly increase their productivity.

The fish industry is an important one, and a "tasty" component, if you will, of our production, which complements all its sectors in a highly organic way, in addition to the fact that a number of social factors impel us to engage in this economically beneficial activity. In the first place, we improve the supply of valuable products for the population. In the second place, and this is particularly important, the fish industry is a traditional occupation of the indigenous population of the autonomous okrugs. Furthermore, there are hundreds of thousands of people in the south who have long been accustomed to fishing. Fish adds variety to the menus of workers' dining halls. Finally, we also see a certain educational value in fishing. It seems to us that it can "bind" the man to the place, and instil in him a more thrifty attitude toward nature.

Overall, the protection of the environment is increasingly becoming a subject of special concern. It is true that not everything has been done, but nonetheless the fact that signs of the handsome elk, roebuck, rabbits and foxes, which had disappeared from the Tyumen' area, are being found again, is indicative. This is aided to a considerable degree by the creation of reservations and by increased activity on the part of animal lovers' societies and hunters. Our land still abounds in mushrooms, berries and cedar nuts. Consumer cooperatives are supplying so many of them that they are found in dining halls and shops practically year round.

But fish, furs and mushrooms are still far from being all of our wealth.

Tyumenskaya Oblast also has a developed agricultural sector. The kolkhozes and sovkhoses in the south plant more than a million hectares to cereals every year

and reap more than 1.5 million tons of grain. The public herds include about 700,000 head of cattle, producing more than 575,000 tons of milk and almost 120,000 tons of meat. More than 500 million eggs and about 17,000 tons of meat are produced on poultry farms and other special operations.

At the June 1970 plenum of the CC CPSU, Comrade L. I. Brezhnev already assigned the task of completely supplying the needs of the population of the oblast with locally produced foodstuffs. Relying on the continuous assistance of the party and government, the cultivators and farm workers are doing everything possible to make production of meat, milk, eggs, grain and potatoes keep up with the growing consumption, and have actually surpassed it in certain areas of production. Let me note that during the last 12 years many people have come to the oblast, and the population has increased by half.

In view of the fact that the population will continue to increase by 3-4 percent annually, steps for the further expansion of the local productive base have been decided upon. In field crop cultivation, a program based on increased yields of cultivated crops and expansion of the sown area has been developed and is being carried out. Specialized production of potatoes and vegetables is being continuously promoted, and hothouse gardening combines have been set up in Tyumen' Tobol'sk, Surgut, Nizhnevartovsk and other towns.

The continuous growth of livestock products even in drought years has made a significant contribution to the ongoing efforts in the oblast to concentrate and specialize agriculture on the basis of cooperation. It is planned to significantly increase the capacities of the Tyumen' Broiler Plant and the Borovskiy Poultry Plant and to build a new poultry plant at Tobol'sk.

We are striving to fulfill more completely the requirements of the conquerors of the north for foodstuffs, especially dietetic. Sovkhozes and secondary farms are being set up in the northern towns and settlements, steps are being taken to increase the production of vegetables and potatoes in personal sideline farming, and collective gardening and vegetable growing are being expanded. The agricultural workers in Tyumen' are doing everything possible to put into practice the decisions of the July 1978 plenum of the CC CPSU.

At the end of last year PRAVDA published an article comparing the American state of Alaska with our Khanti-Mansiyskiy Autonomous Okrug. In spite of profound differences in historical circumstances and social conditions, they have certain traits in common: in the first place the natural conditions are similar, and in the second, oilfields which will have a certain effect of the life of the long-established national minorities have been opened in both places.

What did the young men from Oklahoma and Texas, or their bosses, the owners of the oil companies, bring with them for the Aleuts, Eskimos and Indians, the most unfairly treated citizens of the US? The oil monopolies have stopped at nothing, sweeping their settlements out of their path, destroying the fishing industry, hunting lands and reindeer grazing areas, dooming the indigenous inhabitants to gradual extinction. The oil boom has "bestowed" on the towns of Alaska the invariable "benefits" of American civilization: unemployment, prostitution and banditry.

How different is the fate of the native peoples of Alaska from that of the natives of the Soviet Middle Ob' region and polar area! There is a strict rule among the oil and gas workers of Tyumen': when you arrive at a new site, immediately establish a close sponsor relationship with the inhabitants of the nationality settlements. No matter how large the volume or how short the time for the equipping of oilfields and the creation of new industrial enterprises, the first-priority tasks include the construction of boarding schools for the children of the Khanty, Mansy, Nentsy, Sel'kupy and other nationalities, and the building of new clubs, hospitals, social service centers and dwellings. The oil and gas workers actively aid in strengthening the economy of the hunting operations and the fishing and reindeer raising kolkhozes and sovkhozes and concern themselves with the protection of the environment.

These relationships are two-sided. On one hand, the natives of the autonomous okrugs make use of the help and support to develop public livestock production and provide the oil and gas workers with increasing quantities of meat and fish, while on the other hand they successfully master the new trades of driller, well operator or builder. Many of them receive advanced technical education and work as engineers. Among those who today are examples of shock labor are many who come from a long line of fishermen, reindeer herdsman or hunters.

I began writing about our northern regions and have again come to the subject of "oil and people." This expression is very significant with regard to the Tyumen' area. At Tyumen' there are many things that have to be done for the first time ever. Flooded areas and swamps, frost, large distances, uninhabitable territory, and the scale of the tasks, require a constant search and new solutions. The first billion tons of oil extracted soaked up the courage and energy of the geologists who did the first drilling, the persistence and sharp-wittedness of the builders, the bravery of the aviators, the selflessness of the river transport workers, the drivers, the railroad engineers, the foresters, the grain growers and the livestock raisers: the heroic efforts of all the workers of the Tyumen' area. This billion tons molded a Tyumen' character, which is based on unselfish devotion to the cause of party and people, and readiness to sacrifice personal happiness to the common cause.

Under the conditions of our Soviet, socialist form of life, this phrase stands for the close unity of interests of society as a whole and each individual person. All are for the individual, and everything is for his good: this is the main principle by which the Soviet and party committees of the oblast are guided in all their activities. The new taiga towns of Nizhnevartovsk, Nefteyugansk, Surgut, Uray, Nadym and Labytnangi bear witness to this. Much is being done in the new inhabited northern regions so that each person may perform good work and rest well, may increase his education and culture.

The Tyumen' region has entered a qualitatively new stage: it now must double and triple the quantity of all work associated with the creation of the conditions for highly productive labor and rest for its people. Only this sort of approach will make it possible to convert Tyumen' and the other towns of the

oblast into the major cultural centers which they should and must be, in the light of their position in the country's economy.

Now it only remains for me to repeat the question that was posed in the headline. What are the riches of Tyumen'? What has this glorious region of Siberia to be proud of? Oil and gas, forests and fish. And grain. It may be proud of its people, who have shown that they are equal to the daily struggle with the harsh northern conditions. This is a land directed toward the future, which leaves no one indifferent and which commands special attention.

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## FUELS AND RELATED EQUIPMENT

### PROBLEMS WITH NIZHNEVARTOVSK-KUZBASS GAS PIPELINE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 25 Jul 78 p 1

[Article by V. Noskov (Tomsk): "Accept With Uncompleted Work. Why the Nizhnevartovsk--Kuzbass Gas Pipeline Is Not Operating at Full Capacity"]

[Text] In the first few minutes of our conversation, V. Tolmachev, director of Tomsktransgaz [Tomsk Gas Transport Association], declared: "Things are not going real well with us. Our debt to the consumers is growing every day. Would you like to know the reason?"

Reaching into the safe he brought out two files of papers and, handing them to me, he said sadly:

"I keep all of these documents handy. They contain the whole history of construction of the Nizhnevartovsk--Kuzbass gas pipeline."

I studied the whole file of documents, memoranda, and copies of telegrams. I began to get an increasingly clear picture of the relations between two union ministries and the construction of one of the most important projects in Western Siberia--a 1,700-km long-distance pipeline. The client is the Ministry of Gas Industry, the contractor is the Ministry of Construction of Petroleum and Gas Industry Enterprises.

The project is of special significance to the country's national economy. Once operational, the gas pipeline was supposed to solve two tasks at once. First of all, it would reduce the number of burning flares in the Samotlor field. Secondly, casing-head gas from the Tyumen' fields would supply cheap fuel for the industry of Western Siberia's cities--Tomsk, Kemerovo, and Novosibirsk.

An extremely short timetable was set for the construction of the gas pipeline--just 38 months. Despite all of the difficulties involved in building a pipeline across swamps and bogs, the builders not only laid the pipeline on schedule but also ahead of schedule. This, at any rate, is indicated by the state commission's act of acceptance, which records that on 30 December 1977--16 months ahead of schedule--the gas pipeline was completed.

Obviously, the subunits of the Ministry of Construction of Petroleum and Gas Industry Enterprises should have been complimented with the words "Well done!" But gas industry minister S. Orudzhev, to judge by the document which bears his signature, was in no hurry to give out compliments. It was not until a month later--30 January of this year--that he gave the order for the Tomsk workers to begin pumping the "blue fuel" to the consumers.

But even that date has been adjusted.

"I was the chairman of the state commission to accept the gas pipeline," says Yu. Shcherbakov, deputy general director of Tomsktransgaz, "and I say with full responsibility that both the act and the order were signed on the same day--20 February--that is, they were antedated."

The gas pipeline was submitted with incompleted work totaling 18 million rubles and 60 deviations from specifications. And, naturally, the board of directors of Tomsktransgaz categorically refused to accept it.

One would think it could not be otherwise. But, it turns out, it could. Officials of the two ministries, in Moscow, found a common language, and the Tomsk people had to use all their strength not only to fight off the contractor but also their own ministry. In order to break their resistance, a document was drawn up signed by the deputy minister of the gas industry V. Dinkov and the deputy minister of construction of petroleum and gas industry enterprises Yu. Batalin. It reported that an additional 19 million rubles were to be allocated for developmental construction of the long distance pipeline. In other words, 18 million rubles worth of uncompleted work no longer existed, and the same amount with the addition of one million rubles was allocated for additional measures.

Since the Tomsk people would not give in, additional pressure was applied. First, deputy minister V. Dinkov telephoned the board of directors of Tomsktransgaz and gave the order: "Accept the gas pipeline." The Siberians would not knuckle under. After that, first deputy minister M. Sidorenko telephoned. The Tomsk people did not give into him either. After that came the command from minister S. Orudzhev: "Report to me in Moscow with the act signed."

Many members of the commission did not sign this document. Along with the act, the association's general director V. Tolmachev, complying with the seniority system, sent to the chief of Soyuztranspodzemgaz [All-Union Underground Gas Transport Production Association] V. Kurshenkov a memorandum in which he stated that he did not agree to accepting the pipeline for operation.

Commission member P. Panov, chief of the Tomskaya Oblast office of Stroybank, explained his refusal to sign the act of acceptance in writing: "The startup complex of the Parabel'--Kuzbass Gas Pipeline is in actuality not prepared for operation and it is of low construction readiness. It does not meet specifications of integrated construction. Of the approved makeup of the

complex, incorporating the construction of the long distance gas pipeline and subsidiary-production and service facilities, power, transport, and communications facilities, external hookups for heating, water, and sewers, also beautification, only the pipeline has been laid. Facilities for electro-chemical protection of the pipeline against corrosion are not operational. In all, 18 million rubles worth of construction-installation work have not been completed."

Unfortunately, the Ministry of Gas Industry did not pay any attention to these arguments and, as has been mentioned, issued the order to supply consumers with gas. From the very first day of operation, breakdowns began to occur on the pipeline. This is clear from the work results in the first half year: consumers were to receive 596 million cubic meters of gas; in fact, they got 196 million.

General director V. Tolmachev was obliged to inform ministers B. Shcherbin and S. Orudzhev by telegraph that the construction organizations, despite their earlier assurances, were not taking part in eliminating the breakdowns and were still getting off with empty promises.

"That was last spring," says V. Tolmachev, "but little has changed since then."

To put it frankly, an alarming situation has developed. Subunits of the Ministry of Construction of Petroleum and Gas Industry Enterprises, in addition to eliminating uncompleted work, are obligated this year to complete the first compressor station. It is to be built in Parabel'. But not all of the materials and equipment have been delivered there even yet.

Now, since the gas pipeline has gone into operation, the telephone calls and telegrams have changed direction--to the ministries in Moscow. In most cases, however, the response is not enthusiastic.

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## FUELS AND RELATED EQUIPMENT

### PETROLEUM FOUND UNDER URENGOY GAS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Jul 78 p 3

[Introduction to article: "Large Beacon"]

[Excerpt] The geologists of Tyumen' have another discovery to their credit-- they have struck petroleum in the northern part of the Urengoy field.

As is well known, the industrial exploitation of natural gas began only recently. In terms of its reserves of the "blue fuel," this field has no equals in the world. And now, "black gold" has been detected at about 3,000 meters "under a gas cap." The daily yield of the gusher is about 150 cubic meters. This confirms the notion that there are petroleum as well as gas deposits in northern Tyumenskaya Oblast.

"Production workers and scientists have been years in getting to this discovery," said Doctor of Geological-Mineralogical Sciences and Lenin Prize Winner F. K. Salmanov, chief of Glavtyumenneftegaz [Main Tyumen' Petroleum and Gas Administration]. "They had a hypothesis, and now it is confirmed. It is a triumph, of course. But now we have to prove that it is not an accident. For this reason, our geologists are stepping up the pace of further prospecting not only in the Urengoy area but also in other fields of arctic Tyumenskaya Oblast."

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## FUELS AND RELATED EQUIPMENT

### MACHINERY FOR GAS PIPELINES, METALLURGY

Leningrad LENINGRADSKAYA PRAVDA in Russian 1 Jul 78 p 2

[Interview with N. N. Ivanov, deputy general director of Nevskiy Zavod Association imeni V. I. Lenin, by A. Travin: "Letter From the 'Blue Route'"]

[Text] On the long distance gas pipelines, where a powerful gas and chemical industry is coming into being, and in the metallurgy enterprises, gas pumping units, compressors, and injectors developed by the Nevskiy Zavod Association imeni V. I. Lenin are in successful operation.

How well the collective is filling the orders placed by enterprises and organizations of Siberia and the Far East is the topic of an interview with the association's deputy general director N. N. Ivanov:

Yesterday I went to shop No 8, where work is underway on the most recent gas turbine, of 10,000 kw capacity, destined for the Urengoy--Punga Gas Pipeline in Tyumenskaya Oblast. This machine was assembled in record time by the crew headed by N. A. Bol'shakov, and now the fitters were preparing it for testing on the stand. Next in line was a turbine for the Siberians. There is one test stand in shop No 8, and for this reason the production schedule is drawn up so that the machines are put together as if on a conveyor belt, one after the other, and arrive for testing at a precisely determined time.

The fitters on Bol'shakov's crew, of course, prepared the turbine and tested it on time. Simultaneously, Mikhail Gorbатов's crew was assembling a natural gas injector. Such was the birth of the most recent "ten"--the GTK-10 gas pumping unit.

Today, the Nevskiy Zavod machine builders are sending two-thirds of all the gas pumping units they build to the "blue routes" of Siberia and the Far North. These machines operate in the most unfavorable conditions. The designers proposed the use of special materials in them and perfected a

system for heating the incoming air. Thanks to this, the units have become more reliable and economical to operate. Recently the association received a letter in which the builders of the Urengoy--Punga Gas Pipeline thanked the collective for delivering the equipment ahead of schedule. This made it possible to put the fourth phase of the gas pipeline into operation sooner.

We have an excellent tradition of completing the most important national economy projects ahead of schedule. Only recently the collective warmly congratulated Oleg Fedoseyev and his comrades in shop No 7 for completing a powerful big blast furnace injector for the Western Siberian Metallurgy Combine four months ahead of schedule. All conditions have been created to ensure that the other four machines destined for the "Siberian Magnitka" are also completed ahead of schedule. An injector for the Noril'sk Mining-Metallurgy Combine was also delivered ahead of schedule. In the first 2.5 years of the five-year plan, dozens of our machines have been delivered to Siberia and the Far East.

A special upsurge was evoked among the Nevskiy Zavod machine builders by the appeal from Comrade L. I. Brezhnev during his trip through regions of Siberia and the Far East, addressed to those filling orders for the Siberians and Far Easterners, to help them develop our natural resources. This will require even more intensive work.

The association's collective reviewed its socialist obligations and decided to speed up by one month the manufacture of an injector with a capacity of 6,500 cubic meters of air per minute for the metallurgists of Northern Siberia, and to ship a steam turbine and compressor for a large-tonnage ammonia production operation in the Kemerovo Azot Association not in the fourth quarter but in the third. Other Siberian clients will also receive their machines substantially ahead of schedule. The tradition of completing orders for urgent projects ahead of schedule will continue to be honored.

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## FUELS AND RELATED EQUIPMENT

### KASHIROV INTERVIEWED ON POLAR GAS PRODUCTION

Moscow NEFTYANIK in Russian No 1, Jan 78 pp 5-6

[Interview with S. S. Kashirov, deputy minister of the gas industry, by M. Umanskiy: "Polar Gas: Strategy of Attack"]

[Text] A billion cubic meters of gas each day! This was the mark reached by workers who extract the "blue gold" at the end of last year. This achievement was possible because of the development of powerful new fuel and power centers and, above all, those in Western Siberia and the European North.

The problems related to the assimilation of these bleak regions are discussed by the deputy minister of the gas industry, S. S. Kashirov, in a conversation with our correspondent.

[Question] The Soviet country is not the first to concentrate significant material and labor resources on solving large national economic problems. What are the distinctive features of this "attack"?

[Answer] A most important factor of the industrial assimilation of the remote regions is the unprecedented record high rates. Indeed, is it not surprising that only a couple of years ago the first detachments were just "sizing up" the supplies of gas and now the scale of its extraction from the earth is increasing from day to day. It took only 5 years for Northern and Siberian gas workers to achieve a total annual output of more than 80 billion cubic meters. Under the Ninth Five-Year Plan alone, for example, the proportion of Polar gas in the country's fuel arterials tripled. And all this was accomplished under the conditions of a very severe winter, no roads, marshes and remoteness from industrial centers. And the front of the attack is expanding. In 1977 alone, in Tyumenskaya Oblast, for example, many dozens of large wells were dug, each with a yield of about a million cubic meters of gas per day, and they were hooked up to the country's unified gas supply system. A total of about 500 of these wells will be drilled

during the five-year plan. It turns out that the North will provide more than three-fourths of the union's increase in the extraction of natural gas. I will say further that even today Tyumenskaya workers could produce more than 200 million cubic meters of gas a day if this immense flow could be transported. Here, too, much depends on the construction workers of the Ministry of Construction of Petroleum and Gas Industry Enterprises who are constructing the Northern system of main gas lines.

Another characteristic feature of the assimilation of the "high" latitudes is the coordination of surrounding enterprises into a unified territorial-industrial complex. The economic expediency of this is obvious. After all, gas workers and petroleum workers, in developing their branches, create a basis for the development of other branches of industry as well. Gas-chemical, machine building and other enterprises created on the basis of gas deposits add to these regions the features of economically balanced complexes that are increasingly changing over to self-service.

[Question] Frequently the scale of the movement of the country's main fuel and power base to remote and less populated regions is illustrated by immense figures of capital investments. Without wishing to minimize to any degree the difficulties standing in the way of the vanguard, one still automatically asks the questions: Was everything in the tactics of this "attack" optimally necessary; do elements of poor preparation and inadequate accounting for the specific features of the regions with difficult conditions show through here?

[Answer] Indeed, when assimilating the polar latitudes we had to and frequently still have to make use of "expensive" technical decisions. This is done, as it were, through clenched teeth, mainly in order to ensure reliability, since to neglect this under the conditions of the North, as practice has shown, leads to real disasters.

Just take the roads, for example. How does one construct them and on what, if there are hundreds of kilometers of marshy land underfoot? How many roads constructed in the old way would last even for the first months of use?! And a kilometer of "unsinkable" road built with asphalt and cement costs more than a million rubles.

And the traps set for the drillers by the "permafrost"? Even now its character is largely a riddle. During drilling there is intensive melting of the frozen ground, it "swims" and caves in and cavities appear in the rock masses. Under these conditions it is extremely difficult to do a good job of cementing the wells. It is necessary to use costly, metal-intensive three-column elements.

And in order to prevent melting of the so-called subsiding multilayer frozen ground on the route of the Urengoy-Nadym gas line, it is necessary to cool the gas at the Urengoy deposit. This, you understand, means tens of millions of rubles of additional expenditures.

One can give many such examples. They include the excessively rapid wearing out of equipment and means of transportation as well as difficulties in moving drilling towers over the bad roads in the summer, the transportation of workers to drilling areas by helicopter ....

I am speaking of these difficulties not to justify excessively large expenditures during the assimilation of the northern latitudes, but, on the contrary, to emphasize the special need for a scientific, economically justified approach to all developments in the regions of Siberia and the European North. Because under these conditions even the obvious needs to be examined. And when we do this we achieve a gigantic savings, even in places where it seems that it would be impossible to dream of such a thing.

I wish to mention one idea which is typically northern in its atypicality. The transportation of gas compressed to 120 atmospheres and cooled to a temperature of minus 60-70 degrees promises to be very economical. Since the density of gas doubles under these conditions, the carrying capacity of the pipelines increases greatly. But the main thing is that metal expenditures per unit of transported gas decrease by 20 percent and this means hundreds of thousands of tons of costly metal. It is intended to implement this idea partially even under the next five-year plan ....

Or, for example, bitterly freezing weather. It turns out that one can change this from an enemy into an ally. Even during the winter, atomic ice breakers can lead caravans of ships to Yamal. The many-ton cargoes can be delivered directly onto the "sea" which is gripped in an icy armor. The cost of delivery of the cargoes decreases significantly. And, while in 1976 about 4,000 tons of cargo were delivered to Yamal this way, this year this figure will increase to 50,000 tons. In the future it is intended to increase the annual cargo turnover to approximately 4 million tons at both ends.

[Question] Will this fully solve the problem of material and technical supply for the polar regions?

[Answer] Unfortunately, no. And this pertains primarily to the chemical reagents with which the gas is prepared for transportation. So far, the cost of their delivery to the gas deposits is colossally high. The solution? ... An experimental installation for producing methanol directly from gas is now in the construction stage. The same thing with fuel. From condensate we shall obtain benzine, arctic diesel fuel and kerosene. In the future it is intended to create, on the basis of the Urengoy deposit, an industrial complex which will provide these products for all organizations that are assimilating the underground storehouses of the Siberian polar area.

And in general the changeover of the northern regions to self-supply is the basis of our technical policy in these areas. We intend to create a network

of repair shops here, to construct economical electric power stations with gas turbine installations right at the deposits, to introduce PAES-2500 mobile automated electric power stations more extensively and so forth.

[Question] Returning to the problem of economy .... So far, you have spoken about the prospects of the distant future. But what can one realistically expect in the near future?

[Answer] This was indicated quite specifically in the decisions of the 25th Party Congress which set the task of sharply increasing the efficiency of the utilization of fixed capital through technical rearmament of enterprises and modernization of existing equipment.

In the near future, we intend to improve the installations for preparing gas at the Vuktyl gas extraction complex. With relatively simple work and low (as compared to the rest of the complex) costs, this will make it possible to double the carrying capacity.

The reconstruction of mass exchange equipment at Medvezh'ye deposits will increase the productivity of the installations from 3 to 5 million cubic meters of gas a day and will save many tons of metal. Additionally, the area of the production facilities will decrease by almost half and the number of service personnel will decrease correspondingly. And how much will be saved on labor, efforts and nerves?!

[Question] As one can see from our conversation, the economic effectiveness of the assimilation of the polar latitudes, even taking into account factors that make it expensive, is unquestionable, is it not?

[Answer] Of course. The time periods for recouping capital investments, despite the difficulties we have discussed, are half the average for the country. Another typical feature is that a considerable part of the promised increase in the extraction of gas will be obtained through increased labor productivity. The guarantee of this is the extensive development of socialist competition for putting wells into operation ahead of schedule. By the 60th anniversary of Great October, dozens of production collectives of the polar area had reported early fulfillment of socialist commitments -- the completion of 2-year assignments.

It is noteworthy that, even so, the workers of the branch do not stop with what has been achieved, but strive to achieve new goals. Thus the collective of the all-union Komigasprom industrial association, having extracted and processed 750 million cubic meters of gas in excess of the plan by the 60th anniversary of October, increased this figure to 900 million cubic meters by the end of the year. "From 75 to 125 million cubic meters of gas in excess of the plan" -- this is the motto of the Noryl'sk gas workers.

The rapid rates with which the natural riches of Siberia and the European North are being drawn into the sphere of material production, which contributes to strengthening our country's economic might, are a visible reality of our day.

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PREDICTING CASING-HEAD GAS RESERVES

Moscow NEFTYANOYE KHOZYAYSTVO in Russian No 6, Jun 78 pp 45-46

[Article by S. A. Al'tshuler and T. Yu. Usol'tseva, VNIPIgazpererabotka]

[Text] The practice of erecting different objects of an oil-producing region shows that the length of design and construction of objects for purely oil production is 3-5 years less than the length of construction of a system for utilization of casing-head gas. Consequently, construction of gas refining objects must be begun before exploitation of the deposit to prevent losses of casing-head gas. This is possible only in the presence of sufficiently dependable methods of determining the capacity of the system of utilizing the casing-head gas at the stage of exploration of the deposit.

However, determination of gas reserves during this period is related to a large degree of uncertainty about oil reserves, the values of the gas factor and the annual levels of oil production.

According to data of [1], the coefficient of the confirmability of predicted estimates for oil structures of Western Siberia comprises 1.3, while that without regard to large deposits is approximately 1. If the confirmability of reserves is not considered entirely by the oil-bearing province, but by individual deposits, the deviations from unity are significant. Moreover, analysis of the data indicates a very high coefficient of confirmability for large deposits compared to medium and small deposits.

The uncertainty of the value of the gas factor is related to the inhomogeneity of the composition of stratified oil within the range of a single bed and by the limitation of information at the stage of geological prospecting work.

The forecasting data of the level of oil production by the deposit, including that by individual beds, vary with regard to refinement of the geological-production characteristics and the anticipated mode of operating productive beds, the proposed technology of exploitation and organization of the deposit, the rates of drilling and construction and also variation of the needs of the country for oil raw material.

As a result the actual level of production during a given time period may differ significantly from the predicted level.

Because of the uncertainty of the indicated factors, predicting casing-head gas reserves at the stage of exploration of the deposit is inevitably probabilistic. Taking into account the forecasting error permits a probabilistic description of the sources of uncertainty.

According to our data, the mean square deviation related to uncertainty of oil reserves comprises approximately 0.15, which permits the use of the 90-percent confidence interval of reserves, equal to 0.6-1.4 of the anticipated value. The boundaries of the confidence interval were determined by the absolute value of the mean square deviation, averaged in time (by years of exploitation of the deposit). Deviations in the value of the gas factor for individual wells of an oil bed are found to be within the range of  $\pm 10$  percent of the mean value. The given mean square deviation of the level of oil production comprises 0.1-0.15.

Forecasting reserves with analytical description of variation of the anticipated level of production by years and possible deviation from it is more promising.

The curves of the rates of oil sampling for each deposit, regardless of the difference in the value of the reserves, the geological conditions of oil deposition, its properties and other factors, are identical in nature. Three sections are clearly determined which correspond to three periods of exploitation [3]: an increase of oil production, stable and high production and a decrease of oil production.

The curve of the rate of oil sampling may be described sufficiently accurately by an equation of type

$$Q = \frac{1 - e^{-k_1 t}}{1 + a e^{-k_1 t}} e^{k_2 t},$$

where  $Q$  is the annual oil production;  $k_1$  and  $k_2$  are coefficients which reflect the rates of introduction of operational wells and a decrease of production for individual wells, respectively;  $t$  is the year of exploitation of the deposit; and  $1/a$  is a coefficient which characterizes the level of the extracted oil reserves.

The curve of the rates of sampling for each deposit may be described by selecting the corresponding values of the coefficients. In this case the anticipated level of all production (mean value) and the deviation from it permits determination of the statistical processing of the coefficients in the equation which describes the rate of sampling as a whole during the entire period of exploitation of the deposit rather than the annual oil production. This averaging of indices improves the accuracy and dependability of the result.



By considering uncertainty factors as independent, one can estimate the overall inaccuracy of predicting gas reserves and the confidence interval of the prediction. According to our data, the given mean square deviation comprises 0.3-0.4, with regard to which the 90-percent confidence interval for an individual deposit comprises 0.3-1.7 of the mean value. It is natural that the dependability of the forecast increases considerably with an increase of the number of deposits so that the confidence interval for four deposits comprises 0.55-1.35, while that for nine deposits comprises 0.9-1.1.

The probabilistic nature of the problem requires selection of engineering solutions by the use of casing-head gas with regard to possible levels of its reserves. Thus, if the casing-head gas reserves for a region are determined by an interval of  $6 \pm 2$  billion  $\text{m}^3/\text{year}$  rather than simply by a single value, for example, 6.0 billion  $\text{m}^3/\text{year}$  as is done traditionally, the decisions made on construction of GPZ [gas refining plant] for a capacity within the range of 4-8 billion  $\text{m}^3$  depend on the relation of the cost of constructing the GPZ on the one hand and on the cost of gas losses with regard to restrictions on material and labor resources on the other hand.

#### BIBLIOGRAPHY

1. Kulakhmetov, N. Kh., V. I. Shiil'man, G. I. Plavnik and N. F. Beresnev, "Analiz podtverzhdayemosti perspektivnykh zapasov nefiti i gaza po zapadno-sibirskoy neftenosy provintsii" [Analysis of the Confirmability of Future Oil and Gas Reserves Throughout the West Siberian Oil-Bearing Province], Tyumen', ZapSibNIINP, 1976.
2. Ventsel', Ye. S., "Teoriya veroyatnosti" [Probability Theory], Moscow, Nauka, 1976.
3. Permyakov, I. G., "Ekspress-metod rascheta tekhnologicheskikh pokazateley razrabotki neftyanykh mestorazhdeniy" [An Express Method of Calculating the Production Indicators for Exploitation of Oil Deposits], Moscow, Nedra, 1975.

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## FUELS AND RELATED EQUIPMENT

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### USING DIRIGIBLES IN OIL AND GAS FIELD EXPLOITATION

Moscow NEFTYANOYE KHOZYAYSTVO in Russian No 6, Jun 78 pp 51-52

[Article by A. I. Melua, LenNIIP gradostroitel'stva]

[Text] The absence of a dependable transport system is frequently the main question in exploitation of deposits, especially in northern and other remote regions. The hydrological regimes of rivers, the most important transport arteries, are frequently disrupted, which interrupts the plan of shipments. Moreover, many piers are not adequately equipped and the shore services are low capacity; all this significantly hinders the development of natural resources.

The construction and operation of pipelines are very expensive. Moreover, two great disadvantages are inherent to pipelines. First, the problem of transport of other types of freight is not solved and second, the pipeline becomes economical after depletion of the deposit.

Selection of the system and methods of transport also affects the town-building policy in a given region. Investigations show that neither watch nor expeditionary methods of developing natural resources solve these problems. Therefore, a search for new methods of transporting goods and for the corresponding transport equipment is required for effective solution of the problem. We feel that one of them is dirigibles.

There is no need to consider here the engineering of dirigible building. Generalizing the investigations of the last few years in this field, one may note that the present scientific and technical level permits development of dirigibles with hoisting capacity up to several thousand tons and travel speed up to several hundred km/hr. There are presently no extensive investigations on the purposeful use of dirigibles for development of natural resources.

Let us present a possible scheme for use of dirigibles in development of a new deposit using a specific example.

It was established as a result of analysis that creation of a village was feasible in this region. Equipment and materiel (Figure 1, a), temporary housing and other freight (Figure 1, b) required for exploitation are delivered by dirigible from the base city, located at practically any distance from the deposit. After installation of the equipment and beginning of oil production, dirigibles transport oil containers (Figure 1, c). To save time they may operate by the shuttle scheme, leaving a delivered container for filling (or emptying) and transporting at this time another one. Transport of people may also be organized if required. After depletion of the deposit, the equipment, buildings and other freight are transported by dirigible to a new section (Figure 1, d).

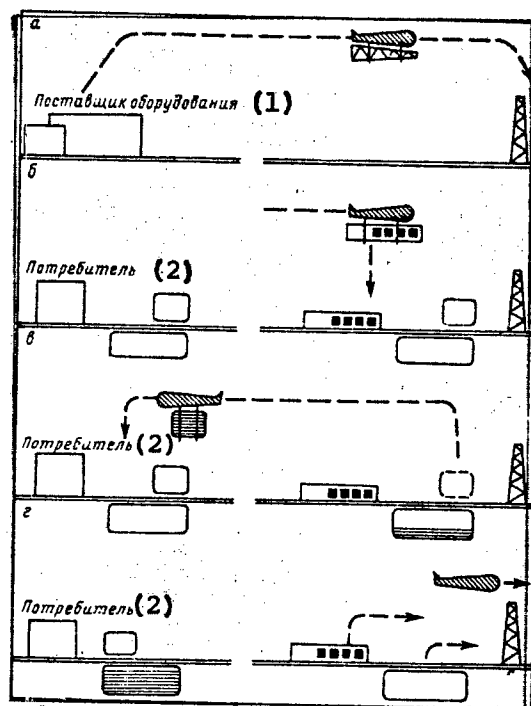


Figure 1. Use of Dirigibles for Exploitation of a Deposit: a, b, c and d -- transport of equipment for deposit, structures and materiel, oil tanks and dismantled structures and materiel

KEY:

1. Equipment supplier

2. Consumer

A saving is achieved in this case by reducing expenditures for preparatory work and construction of roads, reducing the anthropogenic effects on natural objects, increasing the dependability of transport flows and improving the town-building system of the territory and the working conditions of the workers. This system is applicable not only in exploitation of a deposit but also in mineral prospecting. The mobility of the prospecting is increased and cutting timber is reduced in this case.

The use of dirigibles for transport of freight opens up wide prospects for optimization of the territorial development process. This is especially true for Siberia, where this process is industrial in nature. However, there are no calculations of any kind of the effectiveness and variants of using dirigibles. Therefore, the construction and special organizations and institutes must conduct investigations in this area on the basis of the advances of science and technology, the main stages of which may be:

analysis of the possibility of development and selection of an optimum dirigible variant for freight transport;

working out a process flow diagram for dirigible use in exploitation of a deposit;

technical-economic comparison of the variants of freight transport by dirigible and by other means;

working out recommendations on town-building investigations and proposals for regions where dirigibles are used for freight transport.

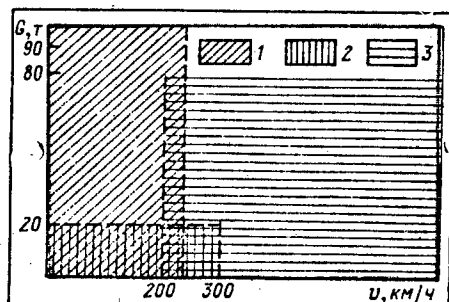


Figure 2. Dependence Between Speed  $v$  and Hoisting Capacity  $G$  of Dirigibles (1), Helicopters (2) and Aircraft (3)

Preliminary investigations show that the use of dirigibles will provide a significant saving (Figure 2) since the hoisting capacity of a dirigible is practically unlimited with restriction of its speed to 200 km/hr compared to other types of air transport.

Modern navigational equipment and communications with satellite systems would support dirigible travel under any conditions.

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## FUELS AND RELATED EQUIPMENT

### PETROLEUM DRILLING INDUSTRY'S PROGRESS

Moscow NEFTYANOYE KHOZYAYSTVO in Russian No 6, Jun 78 pp 3-11

[Interview with director of VNIIBT, Doctor of Technical Sciences, honored worker of science and technology of the Azerbaydzhan SSR, winner of the State Prize A. A. Asan-Nuri and other specialists of the institute on the occasion of the 25th Anniversary of VNIIBT]

[Text] [Question] What are the main tasks of VNIIBT [All-Union Order of the Red Banner of Labor Scientific Research Institute for Drilling Techniques].

[Answer] The task of the institute is to develop technology of driving test and operational wells of different structures and depth under various geological conditions; of developing a wide nomenclature of drilling and core-sampling tools; of developing designs of drilling pipe, casing strings and reinforced drilling pipe; of developing configurations of the bottom of the drill string; of developing bottom column and intracolumn packers of various designation and other intrawell tools and equipment.

Development of driving motors differing in type and technique of use occupies an important place in the work of the institute. The institute continuously conducts research in the field of drilling mud, specifically, on synthesis of chemical reagents (salt-resistant, high-temperature and so on). The problem of inclined-directional drilling, the specific weight of which has recently increased in the total volume of drilling in the country, occupies a special position in our work. This is a complex topic which includes problems of both drilling technique and development of hardware with regard to the characteristics of the region of the country. One of the varieties of inclined-directional drilling of independent significance in oil production is driving branching-horizontal wells. This problem was solved for a long time as a purely drilling problem but work is now being conducted jointly with specialists on exploitation of deposits.

[Question] The problem of deep drilling has been determined in the literature. What is the institute doing in this field.

[Answer] Deep drilling (wells more than 4,500 m deep) occupied only 5.2 percent of the total volume of drilling operations in 1976, while capital expenditures for accomplishing it comprised 12.6 percent of the total expenditures for drilling operations. In deep drilling, driving with bits is very low and the cost of 1 meter of drilling is high. Therefore, improvement of the technique and technology of sinking deep wells is one of the most important trends in the activity of the institute. Problems related to driving superdeep test wells (7,000-7,500 meters deep or more) are also related to this problem. The institute is devoting special attention to drilling wells more than 7,500 meters deep, usually emerging in the role of the general designer and participating in the drilling.

[Question] Besides the oil and gas industry, in which branches of industry are the developments of the institute used.

[Answer] The volume of drilling operations in the oil and gas industry now comprises approximately 15 million m/year, while the total volume of drilling operations in the country exceeds 75 million m/year. This includes drilling large-diameter (3-6 m) shafts at ore and coal deposits. This is an independent problem in related branches and the method of reaction turbine drilling (RTB), developed at our institute, is used extensively here. All the auxiliary shafts are drilled by this method now in the Donbass during reconstruction of mines. Besides RTB, this method is used in bridge construction and hydraulic engineering construction.

[Question] What characteristic features of organization and what methods of work of your collective deserve the greatest attention and how can they be utilized by similar enterprises.

[Answer] Among the characteristics which provide success of our work and which we value, several can be named.

First. Expansion of the volume of theoretical investigations to improve the scientific level of scientific research and experimental-design work carried out and to subordinate the structure of the institute to the problems of successful fulfillment of all stages of this work -- from idea to industrial introduction. Subdivisions of technological and machine building profile have been created for this with whose help the entire cycle of work is fulfilled through the efforts of the institute.

Second. Development of our own machine building base, including two plants and several workshops. This will permit the institute to manufacture not only experimental models for testing on laboratory benches and under full-scale industrial conditions in wells on the proving grounds of the institute, but also small lots of articles for testing in the fields.

The institute has 10 test sections in the main oil-producing regions to carry out extensive tests of equipment and techniques developed by the institute and to work them out under specific production conditions.

Our plants produce rubberized articles, up to 30,000 precision casting turbines annually and 100,000 plastic turbines annually for their own needs.

The institute has a well-equipped branch at Perm' and its own experimental plant, whose capabilities can be judged by at least the fact that positive-displacement motors are completely manufactured here. Work on driving hydraulic motors occupies a large volume at the Perm' Branch of VNIIBT. Its workers have made a decisive contribution to the development of quiet-running helical motors for drilling wells.

Third. The problem of personnel. The necessary conditions have been created at the institute for the growth of personnel. There is a graduate program and there are councils for accepting candidate and doctoral dissertations. Every job performed according to the plan of the institute is supported with the necessary experimental base, qualified management and timely consultations. Among the specialists of the institute are 10 doctors of sciences, 150 candidates of sciences, 2 winners of the Lenin Prize and 6 winners of the State Prize.

Fourth. Contacts with drilling enterprises are of important significance to us. They are characterized by the fact that they rely on our peripheral sections on the one hand and on participation of local drilling cadres in testing, exploitation and introduction of the developments of the institute on the other.

[Question] How is the institute managed on the part of the ministry and do you have any desires.

[Answer] The branch science management system was recently reorganized in the Ministry of the Petroleum Industry. Whereas the institutes were previously subordinate to the corresponding administrations (VNIIBT was subordinate to the Administration on Development of the Technique, Technology and Organization of Drilling), we now, like all specialized NII of the branch, are subordinate to the Technical Administration. According to the reorganization, our institute is called a "specialized" institute and in some documents it is called a "head" institute. Our functions as a head institute are also not clearly defined. We feel that the reorganization on management of science in the system of Minnefteprom must be completed by concentrating problems of the administration of the current activity of the institutes in the Technical Administration, while problems of introducing finished work must be concentrated in the Administration on Development of Techniques, Technology and Organization of Drilling.

[Question] What is the significance of the work of the institute collective in the field of drilling technology and what problems are the subject of study.

[Answer by deputy director, Doctor of Technical Sciences A. A. Gayvoronskiy] The beginning of research in the field of drilling technology at VNIIBT dates to 1953 when the department of the technology of drilling operations was created. The topics of the department included research in the field of

drilling modes, reinforcement of wells, control of sediments, accidents and curvature and operations on the technology of drilling sloping-directional wells. Rendering assistance to drilling enterprises in solution of various scientific-technical problems was and remains traditional for the institute. The main topic in drilling technology is research directed toward development of a scientifically based production process of constructing wells as a whole with regard to efficient use of the available hardware and production modes developed inside and outside the institute.

A mathematical model which permits selection of the optimum parameters of the drilling mode to achieve maximum drilling and cruising speed or minimum cost of 1 m of driving, was developed, checked in many regions of the country and extensively introduced in the 1960's-1970's as a result of the fundamental research of Soviet and foreign scientists in the field of breaking down rock with bits having cutting equipment and open support.

The developed express methods of determining the optimum parameters of the drilling mode directly during the drilling process serve the same purpose.

The increasing use during the past few years of bits with hard alloy equipment and sealed oil-filled supports in drilling wells also requires development of a mathematical model for determining the optimum mode parameters for these bits. Although the general principles of solving this problem remain the same as for bits with cutting equipment, there are specific characteristics which require a different approach to controlling the work with this bit.

A special note should be said about drilling under balanced pressure in the borehole shaft system -- the bed, since, unlike the ordinary method, optimum rotational frequencies have higher values in balanced drilling. This is indicated by theory and it is confirmed by drilling practice.

The use of multifactor analysis which takes into account the effect of not only the axial load and rotational frequency but also the hydraulics, rheology of muds, differential pressure, compacting of rock with depth, instantaneous filtration and other factors on the operating indices of the bit, is known.

[Question] It is known that VNIIBT devotes a great deal of attention to drilling test-production wells. What is the significance of these wells.

[Answer by head of the department of deep drilling technology, Candidate of Technical Sciences Ya. A. Gel'fgat] To improve the technical-economic parameters of drilling and to optimize the drilling process as a whole at great depths, VNIIBT in 1961 proposed that special test-production wells (OTS) be drilled in them prior to the beginning of massive drilling of deposits whose prospects have been confirmed by exploration. It was proposed that the designs of wells, the type of rock-crushing tools, efficient methods of drilling, optimum parameters of the drilling mode and flushing and also an efficient complex of both surface and deep hardware be selected on a



scientific basis from the results of drilling. The institute has designed and is driving test-production wells jointly with the drilling enterprises in Azerbaydzhan, Kuybyshevskaya and Volgogradskaya oblasts, Belorussia, Bashkiriya and other regions. The investigations conducted by VNIIBT during drilling of OTS made it possible to establish baseline functions between the main parameters of the drilling mode and to propose a mathematical model of the process of deepening the bottom.

Utilizing the experience of drilling OTS on the Kudinovskaya site of Volgogradskaya Oblast, it was possible to increase the mean drilling indices almost twofold over a period of 4 years.

The commercial rates in wells drilled with participation of VNIIBT at the Orenburg and Shatlyk gas deposits were doubled within even shorter periods (only during 1971-1974). Similar results were found in practically all regions where test-production wells were drilled.

According to the results of these operations, Minnefteprom published an order in 1970 which obligated all associations jointly with territorial scientific research institutes to develop drilling technology based on driving test-production wells. The institute has repeatedly published (in 1968, 1971 and 1976) a method of driving OTS which establishes the list and sequence of operations when drilling the well and during research to obtain the information required to design the optimum drilling technology on a given site.

VNIIBT jointly with the territorial institutes is now conducting this work at most production associations.

More than 150 OTS, including approximately 30 in 1977, have been drilled and VNIIBT, being the heat institute in this field, coordinates the work of all institutes and renders methodical assistance to them and to the drilling enterprises.

[Question] With regard to the increasing volume of drilling sloping-directional wells, tell me about the work of the institute in this field.

[Answer by Head of the Laboratory of Drilling Sloping-Directional Wells and Controlling Curvature, Doctor of Technical Sciences A. G. Kalinin] The technique and technology developed by the institute permitted us to make the cluster method of constructing wells the main one in drilling the deposits of Western Siberia. In this case the indicators of drilling sloping-directional wells are similar to those of drilling vertical wells. Sloping-directional wells with large deviations from the vertical are being drilled successfully in different regions of the country. The record in the USSR is a well drilled on Sakhalin Island, where the deviation reached 2,500 m.

However, there are still unresolved problems in this important matter.

The main difficulties are as follows. With the current high drilling speeds, sloping-directional wells still rather frequently fail to fall into the planned tolerance range, which is related to the absence of means of monitoring the deviation of the well and of the position of the bit on the bottom during drilling.

The possibility of adhering to the planned profile and the accuracy of the entry of the well into the productive horizon within the limits of rigid norms must be provided. To do this, a control complex must be created which will permit solution of this problem at high drilling speeds and low amount of chiseling.

Problems related to conducting a complete cycle of logging operations in sloping-directional wells have not been solved. There is yet no dependable solution of the problem of bringing the bit to the bottom in severely curved wells with large deviation from the vertical and, accordingly, in horizontal-branching wells.

Our collective in cooperation with many specialized organizations and enterprises is persistently working on solution of these complex problems.

[Question] What has the institute done to develop superdeep drilling technology in our country.

[Answer by head of the Laboratory of Rotary and Turbine Drilling Technology, Candidate of Technical Sciences A. V. Orlov] A great deal of attention is devoted at the institute to solution of problems of deep and superdeep drilling.

The data of worldwide practice of drilling and superdeep wells are first analyzed and generalized which indicated the enormous role of the correct combination of hardware and production procedures of drilling. They include regulation of the differential pressure instead of the widely used principle of depression of the bed, the use of high quality drilling mud (including that with low solid phase content), realization of high hydraulic outputs on the bit and optimization of drilling modes. These problems have also determined the main trends of the work of VNIIBT in the field of the technology of drilling deep and superdeep wells. The main condition in this case is the direct participation of the institute in planning and drilling these wells under different geological conditions.

Along with the specially conducted investigations on drilling modes and other technological problems in these wells, an efficient combination of available hardware and production procedures was realized under the supervision of this institute, due to which high indicators were achieved in driving the wells.

Thus, a high commercial rate of 500 m/st·month for wells of this category was achieved in optimum drilling modes in the Azerbaydzan SSR in well 57 of the Alyatskaya stratum 5,000 m deep due to using the most efficient rotary

drilling method under these conditions, waterjet bits and TBVK140 and UBTS pipe 254 and 203 mm in diameter.

Drilling in well 100 of Shakhova Kosa under pressures up to  $240 \text{ kgf/cm}^2$  (U8-7 pumps) with rationally selected turbodrills, bits, drill string and UBT, drilling mud and drilling modes monitored by means of a hydroturbotachometer showed high efficiency in the use of turbodrills at great depths. The rate of drilling this well in the interval of 3,300-5,800 m reached 500 m/st-month, which significantly exceeds the ordinary drilling rates in this region.

High indicators were also found when using 3TSSh turbodrills with 6.5 inch TL in combination with diamond bits in the interval of 6,364-6,509 m.

Without enumerating what was achieved for each specific well, we note only that RTB units 920 and 640 mm in diameter were used for the first time in drilling for oil and gas to a depth of 1,369 m. The results obtained in this case were the basis for developing a normal series of RTB from 394 to 920 mm which are used extensively in drilling oil and gas wells. A method of predicting the time of resistance of an open shaft, developed at the institute, on the basis of investigating the core and slurry, was used for the first time. Lowering heavy casing strings 720 mm in diameter to a depth of 362 m, 426 mm in diameter to a depth of 1,369 m and 219 mm in diameter to a depth of 5,000 m (air mass of 364 t) was accomplished in a single procedure for the first time in the practice of drilling in the USSR.

A depth of 7,521 m was reached for the first time in 1975 in well 1 at Shevchenko, which was possible due to the correctly selected design which provided a reserve diameter at the lower intervals. Light alloy drilling pipe, rotary torque meters, waterjet bits and other new hardware were used successfully in this case.

The direct participation of the institute in drilling superdeep wells, besides solving a number of theoretical and practical problems of important significance for superdeep drilling and development of drilling in the country as a whole, made it possible to formulate the requirements on drilling equipment for superdeep drilling and also to develop a method of compiling projects for drilling wells which is used at all drilling enterprises of Minnefteprom.

[Question] Many drilling specialists manifest great interest in the problem of equilibrium drilling. What work is the institute doing in this field.

[Answer by Candidate of Technical Sciences Ya. A. Gel'fgat and Candidate of Technical Sciences A. V. Orlov] Several years ago VNIIBT began to develop the problem of equilibrium drilling. Approximately 20 organizations of different ministries and agencies were recruited to solve it. Experimental models of the new equipment -- separators for the drilling mud for working pressure of 100 and  $16 \text{ kgf/cm}^2$ , regulating connections with remote control

for 150, 250 and 350 kgf/cm<sup>2</sup> and so on -- have now been developed according to assignments and with the participation of VNIIBT.

The institute has conducted bench and industrial investigations required to solve problems of designing the technique and technology of equilibrium drilling. Methods of predicting bed pressures, based on the use of logging and examinations of the slurry, have been developed, tested and introduced.

Methods of management by the design and drilling of wells with regulation of the differential pressure and instructions on safety techniques in performing work by this method have been developed. Experimental wells have been drilled in some regions in which the operating indices of the bits have been improved significantly, the number of accidents and complications has been reduced and the design has been simplified. A large volume of valuable information about the nature of the occurrence and characteristics of AVPD [expansion unknown] zones has been obtained.

[Question] It is known that VNIIBT has made a decisive contribution to development of the turbine method of drilling. What is being done in this field at present.

[Answer by Doctor of Technical Sciences, honored figure of science and technology of the RSFSR, twice winner of the State Prize of the USSR R. A. Ioannesyan and Doctor of Technical Sciences, honored figure of science and technology of the RSFSR, twice winner of the State Prize of the USSR M. T. Gusman] The oil workers know well how important it is to have multistage turbodrills for development of the petroleum industry, while the turbine method of drilling has become the predominant method in our country. We can drill sloping-directional wells only with a turbodrill.

However, the hydrodynamic characteristics of the first designs of multistage turbodrills were far from optimum. Their considerable disadvantage was the low support resistance. The high rotational frequency of the shift and the relatively low torque transmitted to the bit reduce the cruising speeds of drilling in the absence of high-speed bits and did not permit realization of all the capabilities of high-speed drilling.

Extensive work was always carried out and is now being carried out in the institute on improving the designs of turbodrills and turbine drilling technology.

As a result modern turbo drills have essentially twice as better characteristics compared to previous ones. Sectioning of turbodrills made it possible to reduce the rotational frequency of the turbine and to increase the torque and drilling depth.

Turbodrills with hydrodynamic braking in which the shaft rotational frequency was reduced without increasing the number of stages permitted an increase of the turbine drilling indices when using serial low-speed bits.

The turbodrills developed by the institute during the past 10 years with precision casting turbines provided high technical-economic drilling indicators in Western Siberia and were of important significance for rapid development of the resources of this region. Further improvement of the drilling technique and technology in this region will also probably be related to the turbine method of drilling.

Turbodrills with "floating" stators, distinguished by increased run between repairs, are promising. They have been tested successfully at the drilling enterprises of Glavtyumenneftegaz [expansion unknown] and will obviously find broad application here during the next few years.

Turbodrills with independent suspension of sections on a ball support, developed by VNIIBT are produced serially. Besides increased strength, these turbodrills are distinguished by simplicity of assembly and sectioning.

Work is now being conducted on development of a turbodrill with rotary housing and separation of the flow on roller supports which will be able to operate with a high-pressure waterjet bit without a special seal. Special turbodrills have been developed for drilling with diamond bits.

Along with intensive investigations on further improvement of turbodrill designs and turbine drilling technology, a new design of a hydraulic positive-displacement helical type motor has been developed at the Perm' Branch of the institute.

Because of the high torque on the shaft and its low rotational frequency (up to 200 rpm), this motor permits fuller realization of the capabilities of modern bits. The domestic helical motor exceeds foreign models and, specifically, the well-known "Dynadrill" motor.

Hydraulic positive-displacement motors are now produced with diameter from 54 to 195 mm and have given a good account of themselves both in drilling and in major repair of wells.

Investigations are continuing at the institute on further improvement of the strength of driving motors, improvement of their production characteristics and simplification of operation.

Making use of the presented opportunity, we would like to turn the attention of readers to the fact that the interest of foreign specialists in turbine drilling and hydraulic driving motors has now increased significantly. This is indicated by the fact that the 14 leading foreign firms are conducting active research and design work in the field of developing these motors. Moreover, work is also being conducted abroad on development of high-speed bits.

A. A. Asan-Nuri has already talked about the first success achieved in testing high-speed bits developed by the institute. The foregoing permits

one to assume that the turbodrill will be one of the most important means in the future of significantly increasing the technical-economic indicators of drilling.

[Question] One of the leading trends in the work of the institute is development of new efficient designs of rock-crushing tools. What work is being planned by the institute in this field.

[Answer by head of the department on bits of the institute L. P. Konstantinov] The institute is developing bits for solid drilling by the rotor method and with driving motors and also column tools for taking core samples. Specialists of VNIIBT have been guided in solution of the problem of developing a bit during all the years of their activity by a broad complex program which encompasses both scientific research and experimental design work and extensive experiments directly on the drilling rigs.

In cooperation with plants of Minkhimmash [Ministry of the Chemical Industry], VNIIBT has developed more than 130 standard sizes and designs of bits over a period of two five-year plans. Up to 85 percent of all the rolling cutter bits produced in the country are manufactured from drawings developed by VNIIBT or jointly with the plants.

However, the scientists of the institute feel that much work still remains to be done in the field of developing a highly productive bit and its success will depend to a large degree on machine-building workers. The main task now is to organize serial production by the plants of series 2AN and 3AN bits developed by the institute for rotary drilling and low-speed driving motors.

The latest advances in the field of bit construction are used in designing these bits. Their strength is multiple that of ordinary serially-produced bits.

This confirmed the experience of using them in Tatariya, where 9-10 new bits manufactured by the experimental plant were consumed for drilling a single well instead of 22 of the best serial bits.

The next problem in this field is further improvement of the designs of rolling cutter bits for low-speed drilling and development of a highly efficient bit for high-speed drilling based on type AV bits. The practicality of this is confirmed by the experience of using Sh215 and 9M3GV bits in Western Siberia, where 2-4 bits instead of 8-11 serial bits are consumed for drilling a single well.

Successful development and introduction of tools for taking core samples while retaining the bed parameters are being conducted simultaneously.

The institute is developing bit designs, is manufacturing experimental lots of them at its own plant and is testing them directly on drilling rigs in

the oil-producing regions. This serves as a guarantee for successful development of these very types of rock-crushing tools which the drillers need.

[Question] VNIIBT is known for its work in the field of drilling hydraulics. In what directions are the specialists of the institute working in this field of research traditional to it.

[Answer by head of the drilling hydraulics laboratory, Candidate of Technical Sciences B. I. Mitel'man] Actually, research in the field of drilling hydraulics is traditional for VNIIBT. A large volume of experimental and theoretical investigations conducted by the institute, along with analysis and generalization of the investigations of other organizations, permitted VNIIBT to work out recommendations on calculating the pressure losses in the circulating system of a well being drilled which are used extensively both by enterprises of the petroleum industry and by scientific research and planning organizations. Development of dependable methods of calculating the pressure losses provided solution of practical problems in planning drilling modes, selecting the design of the well and drilling hardware and also, which is no less important, determination of the specifications on newly designed drilling equipment and tools.

The results of investigations on study of the principles of slurry motion in the discharge flow of the drilling mud and ejection of the slurry from the bottom zone are also used extensively in practice. Experimental drilling with waterjet bits in different regions, conducted jointly with drilling enterprises, revealed the possibility of a significant increase of the efficiency of drilling operations by increasing the pressure drops on the nozzles. Approximately 700,000 m with good technical-economic effect were drilled in 1976-1977 at pressure drops of 70-100 kgf/cm<sup>2</sup> in Western Siberia through the joint efforts of VNIIBT and the drillers of Glavtyumenneftegaz. VNIIBT has begun to implement a broad complex of investigations into the process of breaking down rock by high-pressure liquid jets and the technology of using this method in driving wells with regard to its characteristics. A unique bench device has been developed for performing this work.

[Question] What investigations are being conducted at the institute in the field of drilling mud.

[Answer by head of the section of the physics and chemistry of drilling mud, Candidate of Technical Sciences M. I. Lipkes] The Section of the Physics and Chemistry of Drilling Mud has been working for many years on development of reagents which improve the quality of drilling muds and which impart thermal and salt resistance to them.

These are reducers of viscosity -- nitrolignin developed jointly with the Institute of Organic Chemistry of the USSR Academy of Sciences, oxyd and the joint development with TsNILKhI [Central Scientific Research and Planning Institute of the Wood-Chemistry Industry] -- PFLKh [Wood-Chemical Polyphenol].

Modified starch (jointly with VNIItkrakhsyaloproduktov [expansion unknown], gipan and metas (jointly with VPO "Orgsteklo"), which are produced in industrial quantities, have been developed to reduce the water loss of mineralized muds.

Invert emulsions (VIER), developed at the institute, based on a reagent which we developed -- emultal -- are being used with good results, especially to prevent the harmful effect of drilling mud on the permeability and oil loss of productive beds. Production of 10,000 tons/annually of the highly effective lubricating additive SMAD-1 has been organized at the Grozny and Berdyansk Petroleum Refining plants.

More than 150,000 tons/annually of modified bentonite powder is being produced which provides a yield of more than 15 m<sup>3</sup> of drilling mud from 1 ton.

New systems of drilling muds -- calcium inhibited muds developed on the basis of domestic materials jointly with VolgogradNIPIneft' [expansion unknown], have been developed during the past few years at the institute. They have become widespread in most regions in drilling in unstable rock.

Chromate treatments have been proposed for heat-resistant muds. They are used extensively when drilling deep wells with temperatures above 150°C. The heat-resistant emulsion TIE has been developed and has undergone industrial tests at the associations Nizhnevolzhskneft' [expansion unknown] and Saratovneftegaz [expansion unknown] based on the soaps of fatty acids and organic clays. Investigations are also being conducted at the institute in the field of muds with low solid phase content. A system with low solid phase content based on bentonite and a selective flocculant -- metas -- has now been recommended for introduction after successful industrial tests. Potassium and biopolymer muds may be named among the latest investigations of the institute.

[Question] What has the institute done that is new in such an important field of drilling technology as reinforcing the wells and separating the beds.

[Answer by Doctor of Technical Sciences A. A. Gayvoronskiy] Investigations in the field of reinforcing the well and separating the beds were begun at the institute in 1960. The theoretical bases of calculating casing strings were developed here and an empirical formula was proposed on determining the required and sufficient strength for some standard types of casing pipe. Based on experimental investigations, a method of calculating casing strings with regard to their strengthening by the subsequent (previous) string and by a cement ring was proposed and the optimum designs of composite fasteners were developed. Specifically, this permitted the solution of the problem of reinforcing the wells at intervals consisting of unstable rock (salts, plastic clays and so on).

A complex of equipment which improves the quality of cementation of wells (collapsible turbine centering devices, wire scrapers, press-down plugs, a



device for equipping the bottom of casing strings, cementation heads which permit cleaning of the string during cementation and so on) has been developed and introduced into industry. More than 20,000 spring-loaded centering devices alone are now manufactured annually by VNIIBT.

Investigations on development of hydraulic string and intrastring packers for dependable insulation and separation of beds during drilling, reinforcement, testing and exploitation of oil and gas wells were begun in the mid-1960's. The main standard types of hydraulic string packers of type PPG, PK, PGP and PDM for casing strings 140, 146 and 168 mm in diameter and of type PGP for casing strings 219 and 245 mm in diameter have now being developed. The characteristics of PPG and PDM packers correspond to the level of modern foreign models. There are no foreign analogs to the remaining types of packers. All the drilling string packers of VNIIBT are protected by author's certificates.

Highly efficient and dependable string packers of VNIIBT are now being introduced successfully at enterprises of Glavtyumenneftegaz, Bashneft' [Association of the Bashkir Petroleum Industry], Tatneft' [Association of the Petroleum Industry of the Tatar ASSR], Kuybyshevneft' [Association of the Kuybyshev Petroleum Industry], at Soyuzburgaz [expansion unknown] and so on.

A design of the PPV-170 bottom preventer-packer, which has displayed high efficiency and dependability and which has no analog abroad, has been developed to prevent and eliminate discharges and gushers when drilling wells. Minnefteprom has decided to introduce the preventer-packer when drilling wells with AVPD.

Without enumerating everything that has been done in the field of reinforcing wells and separation of beds, it should be noted that all the main recommendations of the institute have been included in instructions and methods and have become the property of practice. Introduction of string and intrastring packers permitted a significant reduction of metal consumption for reinforcement of wells and an increase of the quality of bed separation and accordingly the quality of operational wells. The economic effect for one PPG packer comprised 12,000 rubles, according to Glavtyumenneftegaz, and the economic effect from using packers comprised more than 4 million rubles for all the enterprises of the branch.

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## FUELS AND RELATED EQUIPMENT

### PROBLEMS IN AZERBAIDZHAN PLANT MAKING PETROLEUM PIPE

Baku BAKINSKIY RABOCHIY in Russian 18 Jul 78 p 1

[Article by V. Lisitsyn (Sumgait): "Under the Supervision of the Community"]

[Text] Before the next batch of drill and casing pipes for the petroleum workers of Tyumen' was loaded on the cars, party, trade union, and Komsomol activists of the pipe rolling shop came to the loading platform of the AzTZ [Azerbaijani Pipe Rolling Shop] imeni V. I. Lenin. They made a spot check and found that two of the packets did not have metal rings. Then, loading began under the supervision of representatives of the enterprise's community. And only after the last packet had been loaded on the rail car, on the sides of which someone had written in chalk the name of the client-- "Tyumen, Nefteyugansk UBR-1 [Administration of Drilling Operations]" did the activists leave their post.

It was discovered later that the pipes without the rings got there because of the carelessness of workers in the makeup section. The guilty parties were found and disciplined. This seemingly ordinary but very eloquent fact testifies to the daily attention focused by the plant workers on filling orders for the petroleum workers of Tyumen', the Far North and the Far East.

At present, the shops of the enterprise have broadly disseminated the initiative "Orders for Tyumen' Ahead of Schedule and at High Quality." The initiators were the crews of shift A of the cutting division of the pipe rolling shop.

On receiving a new order from the workers of Tyumen', the shop party committees of the plant held meetings to discuss the problem of filling the orders promptly. It is gratifying to note that the workers take active part in such meetings, making specific suggestions designed to complete assigned tasks better and faster.

Here is how it looks in practice. The plant's party committee approved and recommended broad dissemination of the initiative on 18 May of this year, and already at the end of May the open-hearth furnace workers

increased the output of hard grades of steel by 58 percent, and in July raised the figure to 75 percent.

In the vanguard of competition for ahead-of-schedule and high-quality completion of Tyumen' orders in the pipe rolling shop is the collective of the crew headed by foreman S. Gasanov. Some 97.9 percent of the crew's pipes are top grade. Workers F. Efendiyev, A. Kuliyeu, and others regularly overfulfill output norms and produce tens of tons of goods above the target.

Under difficult circumstances, the pipe rolling workers of AzTZ have managed to complete the Siberians' orders on time; in the first half year they sent 34,440 tons of casing pipe and 4,490 tons of drill pipe to the petroleum workers of Siberia.

As L. I. Brezhnev said during his recent visit to Siberia and the Far East, under conditions of interrelated operations it is essential to complete plan targets everywhere, to ensure strict compliance with plan discipline, to organize control both on the large scale and in each work section. In this regard, the pipe rollers have a large number of complaints to make against their colleagues with which the plant has contractual obligations.

The Moscow Instrument Plant, for example, was supposed to send 400 sets of threading dies in the first half year, but so far it has not sent one. The Azerbaydzhan Plant has written letters and sent expeditors around, but there are no dies yet. The pipe rollers have done a lot of work to adjust their machines, to assure maximum precision of pipe machining, and yet because of these seemingly "trivial" matters they cannot go any further. It reached a point where one of the expeditors sent to the Moscow Plant literally begged these ill-starred dies piece by piece from the workers there and brought 26 sets back to Sumgait. Yet the comrades in Moscow are still getting away with formal replies and promises.

The Azerbaydzhan plant workers have remedied the situation by arranging home-made production of the dies. But this not only takes workers away from handling the main tasks but also has a negative effect on the quality of the product. In the past two months, the pipe rollers have reduced the output of defective products from 13 to 10 percent, but if they had all of the essentials they could lower this to 7 or 5 percent.

The machine builders of the Tbilisi plant imeni S. M. Kirov are moving too slowly in manufacturing their machine tools and bringing them up to standard. Recently they sent four pipe rolling machines to machine pump-compressor pipes. Two of these have already been sent back because they are completely unusable, and the two others have not passed the tests and will also have to be returned.

We can already find many defects in the mechanization line made by the Elektrostal' Heavy Machine Building Plant. It is simply impossible to hook it up to the press. The press should be capable of delivering 90 billets per hour to the machining line, but in this case only 10 billets

can be handled per hour. Such discrepancies make it impossible to arrange rhythmic operation of the production line.

All of these shortcomings must be overcome in the shortest possible time and, very likely, those who are obliged to will find the reserves, funds, and capabilities to complete their part of the task facing all of the participants in developing the petroleum resources of Siberia.

The initiative "Orders for Tyumen' Ahead of Schedule and at High Quality" is being supported more and more in the pipe rolling plant imeni V. I. Lenin, and the metallurgists of Azerbaydzhan hope that their colleagues elsewhere will create a firm basis for further development of this valuable initiative.

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## FUELS AND RELATED EQUIPMENT

### PETROLEUM SYNTHESIS FROM COAL

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 18 Jul 78 p 4

[Article by L. Rodzinskiy: "Gasoline From...Brown Coal"]

[Text] On the table stood two measuring cups that were completely identical, filled to the same level with a clear liquid. And although the measuring cups were covered with cardboard lids, the strong smell of gasoline filled the room.

"Try to determine which measuring cup contains natural gasoline and which contains synthetic," said Candidate of Technical Sciences Tamara Aleksandrovna Titova.

Alas, the contents of the cups did not differ in any way by color, smell, or transparency.

"I was joking," laughed Tamara Aleksandrovna. "Without special instruments it is impossible to distinguish them. Yet there is a difference: so far, the natural gasoline has more octane units. And it is produced from crude petroleum, while the raw material for making the synthetic gasoline is brown coal from the Kansk-Achinsk Basin."

This conversation took place in the fuel hydrogenation laboratory of the Moscow Institute of Mineral Fuels. At the start of the conversation, Tamara Aleksandrovna reminded me of Mendeleyev's clever statement that burning petroleum is the same as stuffing a stove with paper money. Petroleum is a valuable raw material for the chemistry industry. It is used to make hundreds and thousands of essential substances and chemicals. Nevertheless, the lion's share of all petroleum produced is refined to make gasoline for internal-combustion engines. And it literally goes out the pipe, but the fact that the pipe is an exhaust pipe by no means consoles the economists.

This is why it is essential to obtain gasoline from coal, especially Kansk-Achinsk coal, which in terms of its properties is suitable only for burning in power plants, so that converting it to motor fuel constitutes a good gift to the national economy!

"And here is the little device we use to synthesize gasoline," said Tamara Aleksandrovna. "You're lucky: it is operating now."

The "little device" made a remarkable impression. At first glance it was even impossible to determine whether there was any pattern to this confusion of varicolored wires, containers, and instruments. If the whole unit were to be stretched out straight, no building on earth could contain it. Yet it occupied only a small corner of a small laboratory. Then they showed me the beginning and final stage of the process. First they made up a thick paste of finely-ground coal, special catalysts, and fuel oil; the people in the laboratory call it "gruel," which at the finish becomes pure gasoline which the institute's driver's are glad to fill their vehicles with. Also, boiler and diesel fuel. And, in addition, chemical products. Only the ash residues, which make up not more than 10 percent, go to waste.

"Tamara Aleksandrovna, is there any sense in doing all these experiments again?" I asked. "After all, the first hydrogenation plants appeared more than 30 years ago, and the technology has been worked out..."

"But do you know what that technology is like?" Tamara Aleksandrovna interrupted me. "Not only does synthetic gasoline cost several times more than natural gasoline, it also pollutes the atmosphere with sulfur compounds and, consequently, it cannot be used on a large scale. This is why we are trying to develop a fundamentally new technology that does not have these defects."

Much has already been done. Scientists have succeeded in removing the substances containing sulfur from synthetic gasoline.

A second problem is also nearing solution. The new technology worked out in the laboratory has made it possible to come very close to natural petroleum products in terms of prime cost and quality. New catalysts found by scientists have made this possible. They have speeded up the technological process by a great deal. And the main thing is that laboratory technicians have learned to use these catalysts over and over, recovering them every time from the ash of byproduct chemical compounds burned in the boilers.

On leaving the laboratory, I could not resist a sly question:

"Will we soon be finding your product in the gasoline pumps of Tambovskaya Oblast, for example?"

"You won't have long to wait," Tamara Aleksandrovna assured me. "Within the framework of the presently developing Kansk-Achinsk fuel-energy complex, plans call for building a fuel-hydrogenation plant with a capacity of one million tons of coal per year. Thus, our gasoline will find use in other places besides Tambov..."

## FUELS AND RELATED EQUIPMENT

### BRIEFS

TURKMEN PETROLEUM FIELDS--Gograndag. Work is nearing completion here on putting the new petroleum field into production. Pipelines have been laid, tanks have been built for collecting and preparing the petroleum, also four heating furnaces and three group measuring units. These days, the underground well repair crew headed by A. Ismailov of Kumdagneft' [Kumdag Petroleum and Gas Production Administration] is working on developing well No 11. A substantial volume of the work on laying the long distance gas pipeline between Gograndag and Kumdag, 56 km long, also the construction of petroleum field operational facilities, has been completed by the crews of SMU-1 [Construction-Installation Administration] of Sredazneftegazmontazh [Central Asian Trust for Petroleum and Gas Installation Work] headed by P. Azimov, S. Moiseyev, P. Kalashnikov, and I. Isayenko. A substantial portion of the allocated 820,000 rubles has already been spent. [Text] [Ashkhabad TURKMENSKAYA ISKRA in Russian 16 Jul 78 p 1] 6854

TURKMEN GAS FIELDS--Nebit-Dag. Four gas fields have gone into production in the western part of the republic in this five-year plan. Blue fuel from Kizyl-Kum, Kuydzhik, Okarem, and Kamyshldzha is flowing into the Central Asia-Center pipeline. Petroleum collection points and a low-temperature gas separation unit have been built, and pipelines have been laid. These measures have made it possible to boost gas production by 11 times. Last year, the second phase of the Kotur-Tepe compressor station went into operation. Now, casing-head gas production and deliveries have risen by more than two times. In the third year of the five-year plan, 92.5 percent of all reserves of casing head gas will be recovered. [Text] [Ashkhabad TURKMENSKAYA ISKRA in Russian 16 Jul 78 p 1] 6854

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WATER

UDC 631.4.41 + 641.60

#### POLYMERS INCREASE THE FERTILITY OF ERODED SOILS

Moscow ZEMLEDELIYE in Russian No 5, May 78 signed to press 17 Apr 78  
pp 34-35

[Article by E. Yu. Polyakova, candidate for degree in Agricultural Science,  
Ukrainian Research Institute for the Protection of Soil from Erosion]

[Text] Finding methods for restoring soil fertility is of particular  
importance for eroded land.

In recent years, high-molecular-weight compounds (polymers) have been used  
widely for the artificial structurizing of soil. These compounds, which  
are derivatives of organic acids, cause coagulation and can themselves  
coagulate, thereby promoting the formation of binding clumps of soil.

Polymers improve the air-water condition of the soil, increase water  
permeability, decrease run-off and wash-out, contain available nitrogen  
for plants, activate microbiological activity of the soil, and, in the  
final analysis, increase crop yields.

The aggregating role of polymers depends on their properties and dosage.  
Their action and effects can be felt in the soil for a period of 3-6  
years.

Since 1973, the Ukrainian Research Institute for the Protection of Soil  
from Erosion has studied the possibility of using chemical structure-  
forming preparations to combat soil erosion. The present article presents  
data on the influence of polyacrylamide (PAA) on the physical properties  
of soil and on crop yields.

This investigation was conducted in the Sovkoz "Udarnik" of Lutuginskii  
rayon of Voroshilovsgradskaye Oblast on typical slightly eroded, poor  
drainage, heavy-loam chernozem and underlying losslike loam. PAA was  
introduced into the soil in doses of 100, 200, and 300 kg/ha before the  
spring harrowing.



Dry PAA (pellets) has been used for the first time in the Ukraine for the purpose of protecting soil from erosion. It can be applied into the soil with RMG-4 fertilizers or with a SAK-24 seeder simultaneously with planting, whereas the introduction of PAA in liquid form emulsion requires additional (work and) expense.

The application of PAA to the soil, as can be seen from the test results, significantly increases the water stability of aggregates and the erosion resistance of soil (see Table). The number of aggregates, most valuable from agronomic aspects, was almost doubled, and the content of large clumps increased with a simultaneous decrease in the number of erosion-prone particles of  $<0.25$  mm. The aggregates retain the high water stability over 2-3 years after application of PAA to the soil, and the quantity of such aggregates with particle size  $>1$  mm is 25-35%, i.e., it remains practically unchanged.

The use of polymers on eroded soils also improved their water condition. In our tests, the moisture of the soil increased with increasing dosage of PAA, especially in dry periods. In the control, the supply of productive moisture in the half meter soil layer in the spring was only 16.2 mm, in comparison to 28.6, 29.8, and 33.1 mm upon application of PAA in doses of 100, 200, and 300 kg/ha, respectively. In the driest months (end of June) when there was no precipitation at all, the moisture in this soil layer was twice as great when 300 kg/ha PAA was applied as in the control.

Influence of the addition of PAA on the structure of typical chernozem and on the water stability of aggregates for the years 1975-1977 (% average values)

Dose of PAA (kg/ha)	Particle size (mm)			
	$>7$	7-1	1-0.25	$>1$
Without PAA (control)	$\frac{6.0}{0}$	$\frac{42.0}{4.8}$	$\frac{36.0}{67.9}$	$\frac{48.0}{4.8}$
100	$\frac{11.5}{0}$	$\frac{42.0}{26.8}$	$\frac{28.5}{67.8}$	$\frac{53.5}{26.8}$
200	$\frac{12.7}{8.0}$	$\frac{45.5}{31.0}$	$\frac{29.5}{54.0}$	$\frac{58.2}{39.0}$
300	$\frac{16.5}{14.0}$	$\frac{43.2}{24.2}$	$\frac{29.8}{67.4}$	$\frac{59.7}{38.2}$

Note. Numerator - aggregate composition from dry sifting data; denominator - water stability of the aggregates.

Upon application of PAA, good conditions are created for the microbial activity of eroded soils. The activity increased 2.5 fold.

In order to exclude the influence of PAA as a nitrogen fertilizer,  $N_{60}P_{60}K_{45}$  was applied in all test variants.

All of this had a positive influence on crop yields. Winter wheat, upon application of 100 kg/ha preparation, gave crop yield increases on the order of 5.5 quintals upon application of 300 kg/ha PAA, crop yield increases of 9.5 quintal/ha were obtained. Winter wheat upon application of 100 kg/ha preparation gave crop yield increases of 5.5 quintals per hectare, upon application of 300 kg/ha increases were by 9.5 quintals per hectare (NSR 0.05 = 3.25 quintals per hectare). Control yields of corn for silage was 73.3 quintals per hectare, upon application of 100 kg/ha of the polymer it was 84.4 quintals per hectare out upon application of 300 kg/ha it was 130.6 (NSR 0.05 = 7.4 quintals per hectare.)

The investigation of many authors, including those of ours, have established that PAA in chernozems serves as a highly effective stabilizer of the soil structure. The length of positive action of the PAA in the soil is  $\leq 5-6$  years. To obtain a significant effect, it is sufficient to structurize the soil layer to a depth of 2.5 cm.

We structurized eroded chernozems to a depth of 5 cm and found that on application of 100 kg/ha PAA, surface run-off decreased by 43.3%; with 300 kg/ha PAA, it decreased by 177%, while filtration of the water correspondingly increased by 2.5 and 5-6 fold, respectively. Soil wash-out decreased by 6-8 fold.

The investigation shows that PAA is highly effective in protecting soil from erosion and in increasing crop yields.

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